Assessing attention bias with a web-based eye tracker: A preliminary investigation

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Background

- Recently, researchers have begun exploring the potential of web-based eye tracking platforms for use in psychological research, either on their own or to supplement more traditional forms of data collection[1,2].
- These online platforms have distinct advantages:
  - Sample larger population
  - More naturalistic settings
  - Cheaper alternative to specialized laboratory equipment

The current study sought to investigate the potential of WebGazer.js[1], an online eye tracker that utilizes participants' webcams, to collect behavioral and gaze data related to a dot-probe task.

Methods

Participants
A sample of 166 college students were recruited from the University of Texas at Austin (Age 19.5 ± 1.3; 50.6% female; 45.2% White, 31.9% Asian, 8.4% Black, 14.5% Other).

Procedure
Participants completed prequestionnaires (CES-D[3] and demographics) then viewed a series of happy, neutral, and sad faces from the Pictures of Facial Affect[4] (POFA) and dysphoric and neutral images from the International Affective Picture System[5] (IAPS) during a dot-probe task using WebGazer.js[1]. Reaction time and gaze location were recorded during the task.

Webgazer[1]
Clmtrackr – face/eye detection
Ridge regression model sampling cursor movements

$$\mathbf{w} = (X^T K X + \lambda I)^{-1} X^T K Y$$

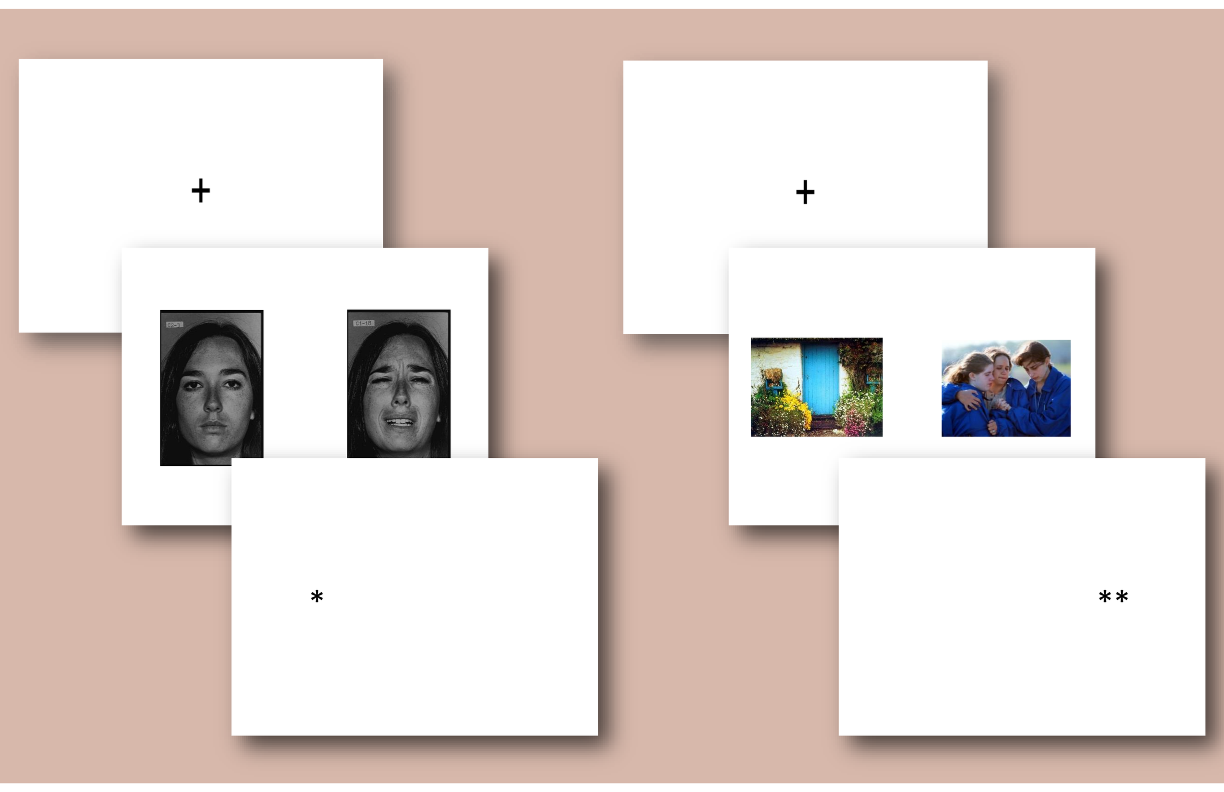

Figure 1. An incongruent trial (left) and a congruent trial (right) from the dot-probe task. After a central fixation cross (1500 msec), a negative and neutral stimulus are presented (POFA = 3000 msec, IAPS = 4500 msec), followed by a cue. Participants respond to the cue by pressing 8 for * and 9 for **. Attention bias is measured by difference in reaction time to congruent and incongruent trials.

Results

For our analysis of gaze bias score, our results revealed no main effect for CES-D group ($F(1, 136) = 0.0285$, $p=0.8661$) and trial type ($F(1, 137) = 1.7275$, $p=0.1909$). For our analysis of dot-probe bias score, our results revealed no main effect for CES-D group ($F(1, 136) = 0.2077$, $p=0.6493$) and trial type ($F(1, 137) = 2.7395$, $p=0.1002$).

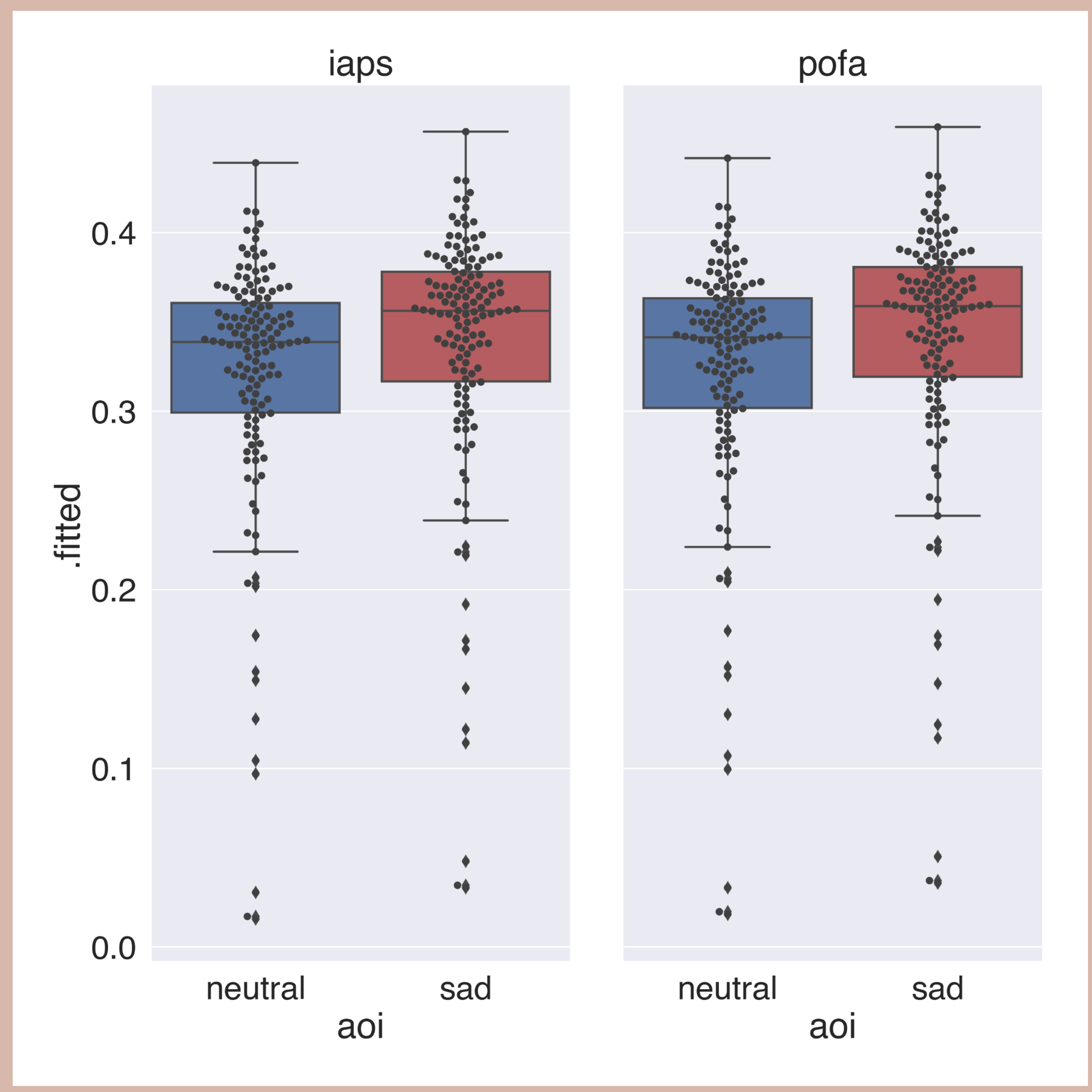

Figure 2. This boxplot provides a comparison of aoi dwell time (msec) for both neutral and sad images and across both IAPS[5] and POFA[4] image inventories. Both IAPS and POFA plots were normalized to allow direct comparison. Results indicate dwell times are higher for sad images, regardless of image type or group.

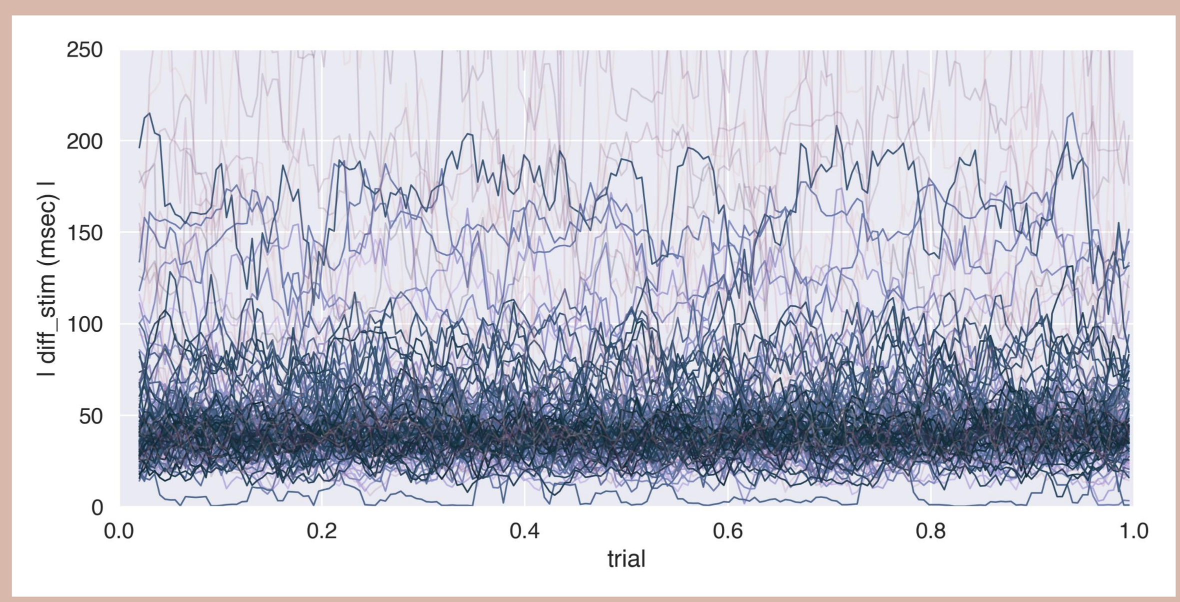

Figure 3. Trend Plot of the Difference Between Expected and True Onset Time for 'Dotloc Onset Error'. Participants with 'Dotloc' or 'Stimulus' onset error rate 3 SD above the median are indicated here with a semi-opaque line.

Conclusions

While there are several factors that could potentially affect data quality including screen size, resolution, luminance, and distance from the webcam to name a few, Webgazer.js[1] has great potential as an open source web-based eye tracker.

Future Directions

- Adding calibration and validation between each block (3 blocks)
- Different tasks
- Pupillary response?

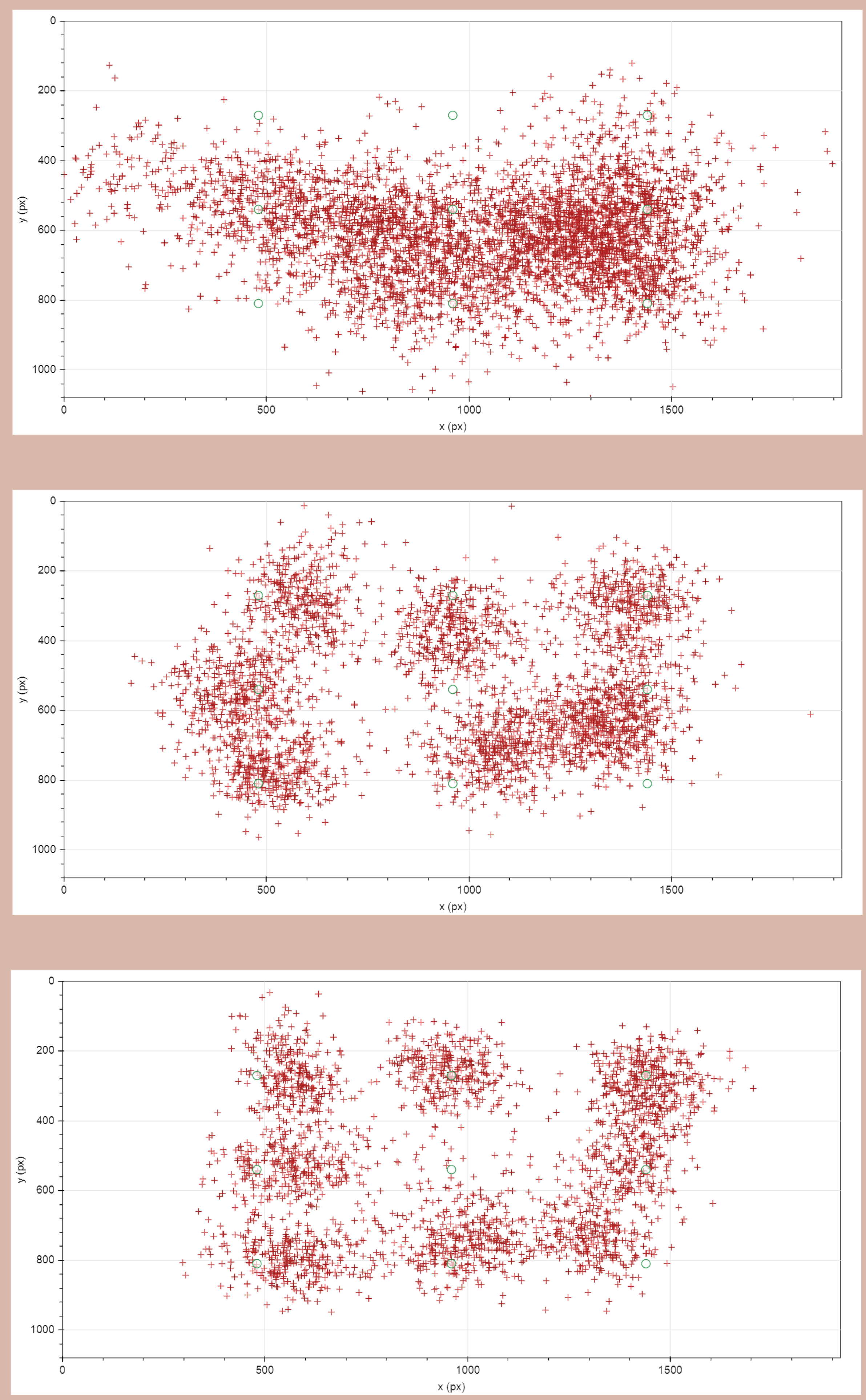

Figure 4. Graph shows change in validation accuracy from the first block, second block, and third block for a single participant.

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References

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